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THE
LARYNGOSCOPE.

VOL. LIV JANUARY, 1944. No. 1

CHONDROMA OF THE LARYNX. REVIEW OF THE LITERATURE AND REPORT OF TWO CASES.*

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Chondroma of the larynx is an extremely interesting lesion because of its rarity and also because of the problems it may present in diagnosis and treatment. In the two cases we have studied laryngectomy was required because of the extent of the tumors. In both instances operation was refused earlier by the patient. The first case has unusual interest because the growth was so enormous and recurred after first attempts to remove it and because such extensive plastic procedures were required following laryngectomy.

Because there has been no comprehensive review of cases of chondroma of the larynx published since Moore's report in 1925 and because considerable discrepancy exists in the statements of various authors as to the number of cases reported, it seems to us worthwhile to bring the recorded material up to date at this time.

Review of Literature: Irwin Moore made an exhaustive search of the world literature and collected 62 cases reported as chondromatous tumors of the larynx. He excluded nine of these, five because they were instances of hypertrophy, and four because they were diagnosed on insufficient evidence. Of the 53 cases that he accepted as true cartilaginous tumors, 39 were diagnosed microscopically; five were diagnosed macroscopically by skilled observers, four at autopsy and one after removal; nine were diagnosed by strong clinical evi-

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dence, one by incision, also by well known authorities. The following is a chronologic list of the authors who reported the 53 cases accepted by Moore in his critical review:

Macilwain, 1831; Froriep, 1834; Virchow, 1863 (two cases); Türck, 1866; Morell Mackenzie, 1870; Porter (first case in United States), 1879; Eppinger, 1880; Stoerck, 1880 (Alexander classified this as inflammatory neoplasm); Azzio-Caselli, 1880; Ehrendorfer, 1881; Bertoye, 1886; Brüns, 1888; Ingals, 1888; Putelli, 1889; Lennon Browne, 1889; Toeplitz, 1890; Bond, 1893; Fränkel, 1894; Flatau, 1894; Gerhardt, 1896; Brindel, 1896; Stoerk, 1897 (same as Ehrendorfer's case, reported in 1881); Alexander, 1900; Witte, 1901; Ecckhaute, 1902; Fränkel, 1904; Swiatecki, 1904; Boerger, 1904; Hartlieb, 1907; Durand and Garel, 1908; Stanley Green and Lambert Lack, 1908 (final results published by St. Clair Thomson); Landwehrmann, 1909; Mansfield, 1909; Moure and Daure, 1910; Moure, 1910; Roos, 1911; Salomonsen, 1914; Eschweiler, 1911; Bolms, 1912; New, 1918; DeGroot, 1918; Waggett, 1921; Irwin Moore, 1924; St. Clair Thomson, 1924.

A careful search of the literature has disclosed 30 cases reported since Moore's review. In 27, the diagnosis was made microscopically, after biopsy or operation, or at autopsy. In three cases (Graham, Figi, Henessey) the diagnosis was made on the basis of clinical and Roentgenographic evidence, and the tumor was not removed. The salient features of these reported cases are shown in the accompanying table. (The only report not available to us was that of Hüttner, so the details of his case are lacking. Figi has alluded to this, however, as an authentic case of chondroma, and hence it is listed in the tabulation.)

The following facts may account for some of the discrepancies in counting the cases. The reports published by Thomson and Waggett, in 1925, were included in Moore's review, even though they were published separately in the same journal in the same year. There has been a total of eight cases reported from the Mayo Clinic, and all of these were reviewed by New and Erich, in 1938. Six of the eight were published previously by Figi, in 1932, and another by New, in 1918. The case reported by New is included in Moore's review. In our tabulation, the six cases reported by Figi are listed under

his name, and only the one case, not previously reported, is listed for New and Erich. Several authors (Clerf, Orton, Henessy) have published their reports of the same cases in two different places (for instance, in the *Transactions* and in a journal), and they may be listed twice in the *Index Medicus*.

Our study, then, indicates that to the 53 cases reported by Moore, 30 additional cases should be added. These, with the two cases recorded herein, make a total of 85 cases of chondroma of the larynx.

Site: According to Moore, the favorite site of development of chondroma of the larynx is on the endolaryngeal surface of the posterior plate of the cricoid cartilage; then follow the thyroid cartilage, the epiglottis and the arytenoid cartilage in order of frequency. In the 30 cases reviewed since Moore's report, the site of the lesion has followed this same order of frequency, with the greatest number arising from the cricoid cartilage. In our first case, the lesion, which was enormous, probably originated from the thyroid cartilage. In the second patient, the chondroma originated from the posterior endolaryngeal surface of the cricoid cartilage.

Virchow stated that it is characteristic of a cartilaginous growth arising from one of the laryngeal cartilages to extend inward into the larynx and obstruct the airway. Although this is usually true, there are several cases reported in which the growth was outward, with no interference with the function of the larynx. The chondroma usually appears as a round, solitary, immobile mass covered by healthy or hyperemic mucous membrane. In some cases, however, ulceration has been reported. The growth may cause mechanical obstruction of the movement of one or both vocal cords. The size of the tumors varies greatly. The smallest are about 1.5 cm. in diameter, and the largest have completely filled the pharyngeal space, with encroachment on the larynx, esophagus and other structures in the neck. The growth in our first case is apparently the largest on record.

Pathology: Histologically, the chondroma consists of the same type of cartilage from which it originates, but in altered form. The tumor consists of spherical cartilage cells irregularly disposed in a matrix of hyaline or fibroelastic substance.

The vascular supply is in the connective tissue or fibrous stroma, instead of from the perichondrium, as in true cartilage. The tumors usually arise from the deeper layers of the perichondrium and contain a capsule. They may undergo calcification, ossification, mucoid degeneration or malignant transformation into chondrosarcoma. Chondromas do not metastasize but have a marked tendency to recur after surgical removal, if any part of the growth remains.

Age: The age of patients included in Moore's review ranged from 17 to 70 years, with the majority between 40 and 60. Thirteen patients were between 40 and 50, 20 between 50 and 60. In the 30 cases reported since then, the youngest patient was 15 and the oldest 81. Five patients were between 40 and 50, nine between 50 and 60, and nine between 60 and 70. Our patients were 48 and 67.

Sex: The ratio of males to females in the cases reviewed by Moore was approximately 4-to-1. In the 30 cases we have reviewed, there were 24 males. Both of our own patients also were men.

Symptoms: The symptoms of chondroma of the larynx vary according to the situation of the tumor, and its size and rate of growth. As a rule, these growths develop slowly, and their presence may be noted only when they begin to interfere with function. Hoarseness and dyspnea are usually the first symptoms. The breathing difficulty may be mild for a long period, with sudden development of extreme dyspnea in case of any change that affects the larynx. Cough may be present and is the most troublesome symptom in a few cases. Tumors arising outside the larynx may cause no symptoms, and the only complaint may be the swelling in the neck. There may be a slight sense of fulness and in some instances dysphagia without pain, due to growth of the tumor into the food passage. Whether the symptoms are referable to the larynx or to deglutition, they usually are mild for a considerable period and hence are ignored by the patient until laryngeal or esophageal obstruction creates concern or alarm.

Diagnosis: The diagnostic difficulties in connection with chondroma arise chiefly from the rarity of these tumors. Because of this, they are sometimes not considered in the differential diagnosis. They are likely to be subglottic, and sub-

glottic tumors always present some diagnostic difficulties. They may also simulate malignant growths. Although the final diagnosis rests on microscopic examination of the tumor section, this is not always infallible, because the hardness of the growth sometimes makes a satisfactory section difficult to obtain. In several recorded cases, the true diagnosis was not possible until the tumor had been removed. The importance of the Roentgenographic examination has been stressed, and Tobeck suggests that both lateral and anteroposterior views should be taken. The Roentgenogram is particularly instructive if there is calcification or ossification of the tumor. Figi has stressed the significance of the appearance of the blood vessels, which stand out prominently in the apparently normal mucous membrane covering a smooth sessile mass. This, he says, is especially striking, and of itself is strongly suggestive of chondroma.

Treatment: The treatment of chondroma of the larynx is always surgical and in general the same as that for carcinoma. Some of the small tumors have been removed by direct laryngoscopy. When the tumor is not too extensive, laryngofissure with complete enucleation of the growth is the method of choice as this restores the larynx to normal function; when the growth is extensive, laryngectomy is required. If any part of the tumor or capsule remains, there may be recurrence. In several of the reported cases and in our own first case laryngectomy was required because of recurrence after laryngofissure. If any part of the tumor has to be left, or if the supporting structure has to be removed, leaving a functionless larynx, then laryngectomy should be done.

Figi has noted that the operative mortality in cases of chondroma of the larynx is greater than that for carcinoma because the surgeon often does not plan for as extensive an operation as must be performed. In the series of cases reviewed by Moore operation was performed in 39 as follows: laryngotomy, eight cases; tracheotomy, eight cases; endolaryngeal removal, seven cases; subhyoid pharyngotomy after preliminary tracheotomy, one case; thyrofissure, nine cases; laryngectomy, six cases, with three deaths; lateral pharyngeal route, five cases, with one death. In the 30 cases we have reviewed, laryngofissure was performed in 10 cases, four after preliminary tracheotomy; in one case, laryngofissure

was later followed by laryngectomy; laryngectomy was done in five cases, three with preliminary tracheotomy; there were two cases of endolaryngeal removal, and two external operations. Tracheotomy, without removal of the tumor, was done in three instances. In three cases, there was no treatment. In this group of cases there were five deaths from infection following operation. Four other patients died from other causes. Good immediate results were reported in five instances, and seven patients had no recurrence. In one, the time was not

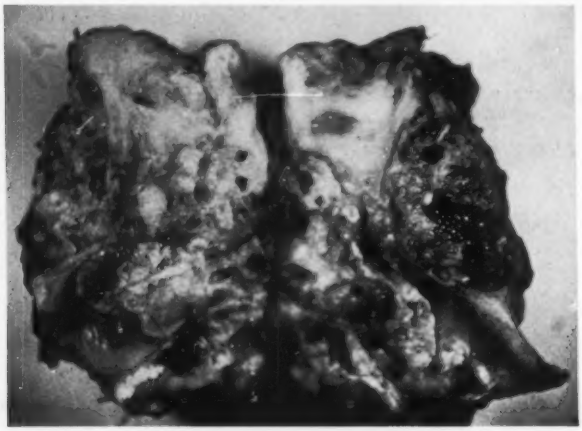

Fig. 1. Enormous mass (5.5 x 8 cm.) removed in Case 1. The growth apparently originated from the thyroid cartilage.

stated, and in the others the time since operation was one year, three years, 16 months, one year, two and one-half years and 12 years. In one case there was a recurrence after six years, but the patient refused a second operation. In another, a second operation was required.

CASE REPORTS.

Case 1: A man, aged 48, had been hoarse for three months and had had severe dyspnea for five days. He had lost weight and had a slight cough. There had been a lump on his neck for a considerable period, which had gradually been increasing in size. Examination revealed a hard mass the size of an acorn, attached to the right side of the larynx and moving with it. The larynx appeared fixed and somewhat larger than normal. The right cord was viewed with some difficulty because of a large boggy mass originating from the right ventricle which protruded

over it. A tracheotomy was performed to relieve dyspnea. The patient did not return for observation until a year later, following a severe hemorrhage through the tracheotomy tube, nose and mouth. He reported that he had had several coughing spells previously which had produced blood. His hoarseness increased, and the tumor in his neck had reached the size of a small egg. A biopsy of the mass was made, and the thyroid cartilage was split for examination of the larynx. The soft parts of the larynx were pushed inward by a mucinous mass between the mucous membrane and the thyroid cartilage. From this, a tubular mass extended out into the neck between the thyroid and cricoid cartilages. This mass extended backward and mesially into a hard cartilaginous formation. A diagnosis of chondroma of the larynx was made both clinically and pathologically.

During the following month, the mass increased in size, and at the next admission the right wing of the thyroid cartilage and the chondroma in

Fig. 2. Undersurface of the pedicle showing full thickness skin lining at time of transfer to neck.

the neck were removed. This mass was composed of cellular cartilage with a pinkish-stained chondrin tissue. The tracheotomy tube was removed at the time the patient was discharged, and his general condition and speech were good.

Four months later an emergency tracheotomy and removal of chondromatous material from the right side of the neck was necessary. Ten months later, recurrence of the chondroma required secondary removal. During the next seven months, the patient had six incisions and drainages of a mucinous cyst in his neck, which continued to discharge a

Fig. 3. Appearance of healed neck wound two months after operation, and at time of closure with pedicle graft. Latex nasogastric tube is seen in the esophageal fistula.

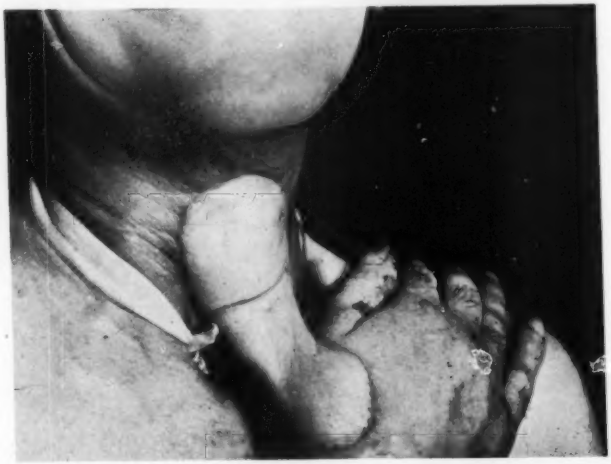

Fig. 4. Closure of esophageal fistula with pedicle graft still attached to hand.

degenerated chondromatous material. Examination showed also that the tumor had recurred.

One month later, through the courtesy of Dr. J. Homer McCready, who had been caring for the patient, a total laryngectomy was performed by one of us (J. W. McC.). This involved removal of a large mass, including the thyroid gland, the larynx and upper five tracheal rings, and the anterior wall of the esophagus. The mass measured 5.5 x 8 cm. (see Fig. 1). The patient's postoperative course was exceedingly stormy because of the removal of thyroid and parathyroid tissue, but this condition was brought under control by thyroid and parathyroid medication. The devoted and meticulous care he received from Dr. McCready during this postoperative period saved the patient's life.

Four weeks after operation, his general condition was good, and the plastic procedure on his neck was instigated. This phase of the treatment was carried out by S. W. Dupertuis and required numerous operations. The first was attachment of a lined flank-pedicle graft to the right wrist, then delay of the flank pedicle attachment. The viable lining graft on the undersurface is shown in Fig. 2. The fistula was closed by trans-

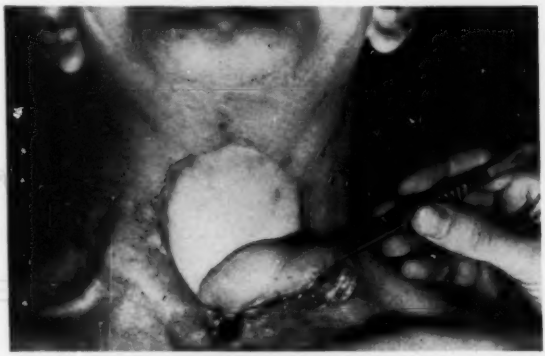

Fig. 5. Appearance of pedicle on neck after separation from hand.

plantation of the lined pedicle to the neck via the right wrist. The entire graft maintained good color; primary healing followed with no infection or formation of secondary fistula. Sulfathiazole was administered through the nasal gastric tube to supplement the crystals placed in the tissues. To assure an effectual airway, a short extension of rubber tubing was connected to the regular tracheotomy tube, and the patient was nourished, throughout the entire reconstructive period, through a soft latex rubber tube extending from the nose to the stomach. Fig. 3 shows the extent of the defect in the neck and the nasogastric tube.

The next step was section of the pedicle graft and reconstruction of the tracheotomy opening. The end of the pedicle was separated from its attachment to the right wrist (see Fig. 4) and the defect on the wrist was closed. After removal of the dense scar tissue surrounding the tracheotomy opening, the free end of the pedicle (see Fig. 5) was split vertically to permit suturing of the two distal sections about the opening. The final plastic procedure was a split skin graft to the granulation tissue

of the donor site on the flank. The present appearance of the reconstructed area is shown in Fig. 6.

The closure of the esophageal fistula was successfully completed without the necessity of a preliminary gastrostomy. The soft latex nasogastric tube, first described by Woldman, played an important rôle in eliminating the necessity for gastrostomy, yet caused no erosion or delayed healing at the site of the graft. It is also probable that the local application and internal use of sulfathiazole contributed to the primary healing of the graft. The nasogastric tube was removed on the twelfth day after operation to close the fistula and the patient has experienced no difficulty in swallowing liquids or solids. Pain and swelling which were present for a time in the right wrist responded favorably to physical therapy.

Parathyroid hormone has not been required since the first month after removal of the chondroma, but small daily doses of thyroid are necessary

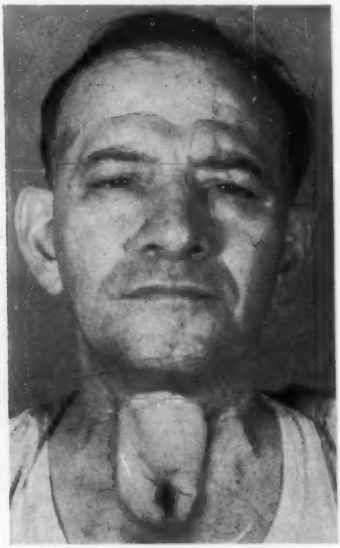

Fig. 6. Patient (Case 1) after healing of plastic procedure on neck and esophagus.

to maintain a basal metabolic rate of approximately — 10 per cent. Two years after removal of the chondroma, there has been no sign of recurrence, and continuous good health has enabled the patient to resume work. With the aid of an artificial larynx, he is able to talk with intelligent clarity.

Case 2: A man, aged 67, complained of hoarseness and shortness of breath which began three years before, following a cold. The condition improved for a time, and then the symptoms were aggravated by another cold. These symptoms became progressively worse, and for the last two months he has been unable to walk more than a few steps without becoming severely dyspneic. He had been treated for asthma, without relief.

When he was examined, he was having severe respiratory distress and was able to talk only in a whisper. Laryngoscopic examination revealed a large, round, smooth tumor, covered with slightly hyperemic mucous membrane. This filled the left side of the larynx, causing a marked narrowing and shifting of the glottic chink to an oblique position. The left vocal cord was fixed. There was no ulceration and no tumor mass could be felt outside the larynx. A tentative diagnosis of chondroma of the larynx was made.

At operation, under sodium pentathol, the larynx was exposed and a cartilaginous tumor was found springing from the left cricoid cartilage posteriorly. This measured 1.5 x 1 inch and extended down to the third tracheal ring and filled the left side of the larynx. Complete laryngectomy was performed, including removal of the tumor mass involving the three tracheal rings. The patient withstood the procedure well, and his

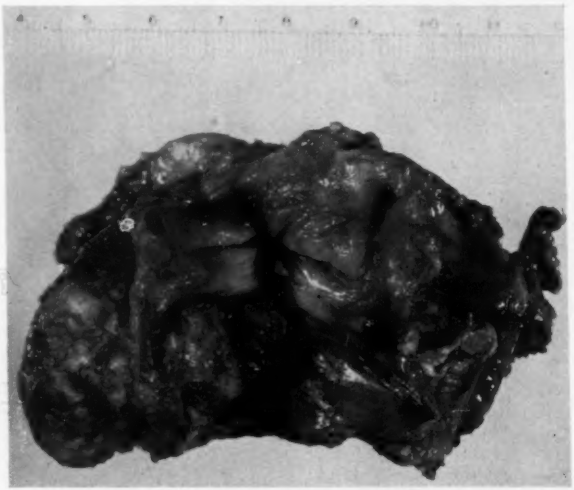

Fig. 7. Tumor mass (Case 2) showing enormous involvement of the left cricoid cartilage.

postoperative course was uneventful except for a mild bronchopneumonia. The pathologic diagnosis was chondroma of the larynx. The mass removed is shown in Fig. 7. Five months after operation, the patient was in good health, and speaking with an esophageal voice.

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CHONDROMA OF THE LARYNX. CASES REPORTED SINCE 1925.

Author	Age	Sex	Symptoms and Duration	Examination of Larynx	Diagnosis.	Treatment	Results and Comments
Woodburn 1926	66	M	Hoarseness 5 or 6 yrs., much worse last 5 mos. Some dysphagia, 12 mos. Some dyspnea. Hard swelling on right side of neck.	Large round swelling appeared to occupy more than half of hypopharynx on right. Right cord hidden and fixed.	Pathologic diagnosis: enchondroma attached to arytenoid and thyroid cartilages.	Deep dissection, opening into lower part of pharynx; removal of cricoid right wing, and part of left thyroid cart.	Patient died 5 days after operation from bronchial pneumonia.
Engelhardt 1926	15	M	Hoarseness 6 mos.	Lower half of arytenoid cartilage involved in tumor. Vocal cords free.	First clinical probability was tuberculoma. Biopsy report was fibromatous tumor. After operation, ossified chondroma.	Laryngofissure 6 wks. after biopsy because of tumor growth. Walnut-sized tumor removed.	This patient the youngest on record with chondroma of larynx.
Birkett and Hutchison 1927	49	M	Hoarseness and swelling on left side of neck, 2 yrs.; worse in last year. Some dyspnea.	Large subglottic tumor filling entire larynx apparently attached to cricoid.	1: Papillomatous hyperplasia of squamous epithelium. 2. Chondroma with calcification and bone formation.	1. Papilloma removed from rt. vocal cord. 2. Two yrs. later, laryngotomy and tumor removal.	Patient died 72 hours after second operation from postoperative bronchitis.
Grossman 1927	61	M	Hoarseness and dyspnea several mos. Patient seen on several occasions with tumor increasing in size and dyspnea becoming progressviely more severe.	Left half of larynx fixed by a tumor with a tongue-like projection under the left arytenoid cartilage. Right vocal cord normal. Laryngoscopic showed hard tumor filling subglottic space. Biopsy showed small foci of cartilage and bone cells.	Chondroma. Pathologic diagnosis after operation, tumor consisting largely of cartilage with some calcification and bone formation.	1. One yr. after observation, laryngofissure; tumor involved cricoid and lower portion of arytenoid. 2. Laryngectomy "typical chondroma of thyroid cartilage."	Tumor continued to grow after laryngofissure, and required laryngectomy. Patient failed rapidly after laryngectomy. Developed pulmonary symptoms and tuberculosis found. Death 1 yr. after laryngectomy from tuberculosis.
Grossman 1927	53	M	Dyspnea several yrs.; severe at time of admission.	Right cord appeared normal. Left cord thickened and also left false cord. Swelling in subglottic space principally on left.	No diagnosis made in life. Pathologic diagnosis at autopsy, chondroma of larynx.	Tracheotomy for severe dyspnea.	Patient developed severe septic symptoms, due to thrombophlebitis, and died 4 wks. after tracheotomy. Tumor involved cricoid cartilage.
Nielson 1929	46	M	Large lump on left side of neck for 8 yrs.	Tumor originated from thyroid cartilage. Laryngeal movements normal.	Chondroma.	External operation without removal of larynx.	Uneventful recovery.
Clerf 1929	48	M	First admission: hoarseness and dyspnea 6 mos. Second admission: 4½ yrs. later, severe dyspnea and dysphagia.	1: Fixation of left vocal cord and impaired motility of right; no evidence of tumor. 2: Large globular mass almost complete occluding the hypopharynx.	Indefinite on first admission. 2. Chondroma from biopsy.	2. Tracheotomy; laryngectomy.	Complete removal of larynx necessary because of involvment of both arytenoid and cricoid cartilages.

(Continued)

CHONDROMA OF THE LARYNX. CASES REPORTED SINCE 1925 (Continued).

Author	Age	Sex	Symptoms and Duration	Examination of Larynx	Diagnosis.	Treatment	Results and Comments
Kurzhals 1930	81	M	Hoarseness 30 yrs.; also had had paralysis of cords. Dyspnea several mos. Severe respiratory difficulty 2 days before admission.	Aryepiglottic area and false vocal cords, pyriform sinus and hypopharnx filled with a tumor. No ulceration.	Pathologic diagnosis chondroma; tumor size of an apple.	Tracheotomy for severe dypsnea.	Patient died days after tracheotomy. At autopsy, tumor found to arise in cricoid cartilage. Long duration, patient's age and size are outstanding features in this case.
Huttner 1931	58		(This journal not available to us, so details of case were not obtained.)				
Figi 1932	64	F	Dyspnea 4 or 5 yrs. Tumor in neck 9 to 10 mos.	Hard nodular tumor right side neck, fixed, and producing marked respiratory obstruction.	Chondroma clinically; confirmed pathologically.	Laryngectomy.	Patient died of pneumonia 5 days after operation.
Figi 1932	57	M	Lump in neck 3 yrs. Progressive hoarseness 6 mos.; respiratory obstruction 6 mos.; slight dysphagia several mos.	Bony, hard and nodular tumor of right thyroid cartilage about 5 cm. in diameter, producing marked bulging of right anterior cervical region. Right vocal cord fixed. No ulceration.	Chondroma.	Tumor removed under local anesthesia.	No recurrence 1 yr. Six yrs. later, local recurrence in right side of neck. Given radium but tumor increased in size. Second operation refused by patient.
Figi 1932	34	M	Dyspnea and hoarseness 10 mos. Slight difficulty in swallowing liquids. Slight loss of weight.	Smooth, rounded tumor in subglottic region. Broad attachment posteriorly on left and appeared fixed. Both cords freely movable.	Clinical and Roentgenographic, chondroma. Histologic, osteochondroma.	Laryngofissure with removal of tumor of cricoid cartilage. Radium applied externally.	No recurrence 3 yrs. later.
Figi 1932	57	F	Hoareness and dyspnea 10 mos. Severe for 6 mos. Choking sensation at times on swallowing liquids. Slight cough. Fatigue.	Rounded tumor in right subglottic region. Right cord fixed in median line.	Roentgenographic, chondroma.	Radium applied externally over neck. Exploration planned 6 wks. later but patient did not return.	Patient died 2½ yrs. later from unknown causes.
Figi 1932	42	M	Hoarseness 3½ yrs.; dyspnea 8 mos. Cough which later disappeared.	Vocal cords depressed slightly to left. Laryngeal examination not adequate because of hypersensitive throat. No biopsy. Two yrs. later nonulcerated mass completely filled subglottic space.	Roentgenogram showed soft tissue tumor in region of thyroid cartilage. Histologic diagnosis after operation, chondroma.	Tracheotomy day after admission. Two yrs. later, laryngofissure with removal of tumor 2.5 cm. in diameter.	No recurrence and good voice 10 mos. after operation.

(Continued)

CHONDROMA OF THE LARYNX. CASES REPORTED SINCE 1925 (Continued).

Author	Age	Sex	Symptoms and Duration	Examination of Larynx	Diagnosis.	Treatment	Results and Comments
Figi 1932	58	M	Hoarseness 6 mos. Slight dyspnea recently.	Smooth, round, nonulcerated sessile tumor 1-2 cm., just below intraarytenoid area in subglottic region. No interference with movement of vocal cords.	Clinically appeared malignant but biopsy was chondroma.	Laryngofissure and tumor removal.	No recurrence 16 mos. later.
Graham 1934	60	M	Voice change 35 yrs.; more pronounced when exhausted.	Smooth tumor above left vocal cord but not obscuring it. Mass in left side of neck in region of thyroid cartilage.	Roentgenographic: calcified enlargement of left thyroid and cricoid cartilages of larynx.	None.	No change in 1 yr. and function of cords remained the same.
Graham 1934		M	Ulcerative tumors of larynx 1 yr.	Tumor mass on right side of larynx with ulceration and obscuring of vocal cord. Large ulceration in left pyriform fossa and small isolated growth on pharyngeal wall.	Chondroma from biopsy.	None.	History of heavy drinking. Patient died in insane hospital from cerebral thrombosis. No autopsy.
Henessy 1935	62	F	Slight dyspnea 7 or 8 yrs. Nonproductive cough. Diagnosed elsewhere as inoperable cancer of larynx.	Mass appearing to fill larynx and upper trachea. Some erosion. Opaque spots of calcification seen plainly on tumor. Tumor appeared to be growing from posterior segment of cricoid cartilage.	Chondroma clinically and Roentgenographically.	Tracheotomy. Tumor not removed. No biopsy.	Patient's condition satisfactory 2½ yrs. after tracheotomy. Because of long duration, it was felt removal of tumor not necessary or justifiable.
Jackson and Jackson 1937	52	M	Complete aphonia following prolonged hoarseness.	Tumor mass integral with cricoid cartilage. Both cords fixed in widely apart position. Ossific plaque visible on convexity of tumor.	Chondroma from biopsy.	None.	Patient had advanced nephritis which proved fatal soon after examination, and contraindicated laryngeal operation.
Jackson and Jackson 1937	24	M		Growth integral with thyroid wing, cricoid, right arytenoid and epiglottis.			
New and Erich 1938	65	M	Recurring dyspnea, 7 mos.	Tumor attached posteriorly to cricoid cartilage filling subglottic region.	Pathologic diagnosis: chondroma with foreign body giant cells.	Tracheotomy and thyrotomy with tumor removal.	No recurrence.

(Continued)

CHONDROMA OF THE LARYNX. CASES REPORTED SINCE 1925 (Continued).

Author	Age	Sex	Symptoms and Duration	Examination of Larynx	Diagnosis.	Treatment	Results and Comments
Tobeck 1939	58	M	Swelling right side of neck 3 yrs., gradually increasing in size but not causing symptoms. Speech rough but not really hoarse.	Hard tumor palpable on outside of neck, involving left wing of larynx, especially the thyroid cartilage. No palpable lymph nodes on neck or elsewhere.	Ossified chondroma pathologically.	Operation showed tumor arose from thyroid cartilage; laryngofissure and tumor removal.	Tumor of marble-like consistency. Good recovery, though patient's voice more hoarse than before operation.
Tobeck 1939	52	F	Dyspnea several mos., not relieved by thyroidectomy. At that time nothing seen in laryngeal examination, but discovered 3 mos. after thyroidectomy.	Left vocal cord hidden by tumor in intralaryngeal space. Right vocal cord unchanged.	Roentgenographic diagnosis, calcified tumor in region of thyroid cartilage. Clinical diagnosis, chondroma.	Tracheotomy for severe dyspnea; laryngofissure. Tumor arose from left thyroid cartilage, growing only inward, without ossification, but with marked mucous degeneration.	Patient had stormy convalescence but eventually recovered. Some dyspnea on exertion but breathing much improved.
Jackson and Jackson 1939	44	M		Entire larynx obliterated but invaded by large mass integral with cricoid and thyroid cartilages. Pharynx occluded by growth.	Chondroma.	Tracheotomy to prevent asphyxia and laryngectomy.	Patient has good pharyngeal voice and in excellent health 12 yr. after operation.
Equen and Neuffer 1940	56	M	"Cigarette cough" several yrs., worse for 6 mos. following cold. Dyspnea progressed to great severity. Dysphagia 2 wks. and extreme dyspnea. Weight loss.	Patient cyanotic. Smooth, white tumor almost occluding air passage. Profuse purulent secretion on making incision for tracheotomy.	Preoperative diagnosis, carcinoma. Pathologic diagnosis, chondroma.	Emergency tracheotomy. Total laryngectomy.	At age 13 had been hit with a baseball in laryngeal region which caused hoarseness for 1 mo. Two mos. after operation had gained 20 lbs. Was well and cheerful and could whisper intelligibly.
Hoover 1940	56	M	Hoarseness 3 yrs. and dyspnea which became severe 2 mos. before. Cough and some strangling spells.	Large subglottic tumor filling entire larynx, apparently attached to cricoid.	Chondroma by biopsy. Pathologic diagnossi after operation, chondroma with areas of ossification.	Emergency tracheotomy, laryngofissure and tumor removal.	Two and one-half years later, no recurrence and patient has excellent voic.
Orton 1941	66	M	Small lump right side neck 20 yrs. Dyspnea and dysphagia 1½ yrs. Tracheotomy 1 yr. before. Considerable weight loss from inability to eat.	Large, smooth swelling in right pyriform sinus encroaching on trachea. Cords hidden. Ulceration on margin of aryepiglottic fold.	Biopsy: chronic ulcerative laryngitis. Clinical: chondroma. Pathologic after operation: chondroma.	Laryngectomy with removal of hyoid bone, larynx and growth.	Patient worked in zinc mines. Well 1 yr. after operation.

(Continued)

CHONDROMA OF THE LARYNX. CASES REPORTED SINCE 1925 (Continued).

Author	Age	Sex	Symptoms and Duration	Examination of Larynx	Diagnosis.	Treatment	Results and Comments
Holinger and Matzkin 1942	40	M	Hoarseness 18 mos. Swelling on left side of neck 2 yrs. Sensation of foreign body in throat. Cough.	Hard, globular mass 3 x 2 cm. attached to thyroid plate. Smooth, rounded supraglottic swelling extending into glottis. Left false vocal cord, arytenoid cartilage and aryepiglottic fold involved in tumor. Left true vocal cord hidden. Size and location confirmed by Roentgenographic examination.	Condroma confirmed histologically.	Removal of tumor.	One mo. after operation, right and left true cords moved freely, there was no supraglottic swelling and patient had normal speaking voice.
Gatewood 1942	63	F	Hoarseness 2½ yrs. Dyspnea 1 yr.	Limited motion both cords. Arytenoid cartilage tilted forward. Oval mass protruding from posterior wall below vocal cords. Roentgenogram showed calcification in this region.	Chondroma.	Tracheotomy and laryngofissure.	Father and grandmother died of cancer. Six and 12 mos. after operation, supraglottic contour unchanged; still some impairment of vocal cord movement. Breathing normal and speech changed from whisper to rough low voice.
Gatewood 1942	61	M	Dyspnea 4 yrs., severe for 2 yrs. Hoarseness and weight loss 1 yr. Tracheotomy and Roentgen treatment 6 mos. before admission.	Thyroid cartilage hard, fixed and prominent. Right cord immovable and arytenoid enlarged and infiltrated. Roentgenogram showed mass in subglottic portion of larynx.	Chondroma by biopsy.	Laryngofissure. Growth originated from cricoid plate and invaded lower portion of thyroid cartilage.	Tumor presents "sago" characteristics described by Waggett. Second operation required several wks. later and a portion of right thyroid cartilage seemingly was detached and necrotic, possibly the result of previous Roentgen treatment. Patient recovered completely after that was removed, and tracheotomy tube was also removed.

NASOALVEOLAR CYSTS.*

DR. FRANCIS A. SOOY, St. Louis.

The apparent unfamiliarity of many otolaryngologists with a clinical and pathological entity of a type that has been estimated to occur once among every thousand of the general population[1] may account for scarcity of reported cases and would seem to justify a repetition of some of the material which has been well covered in European literature.

Nasoalveolar cyst, a mucus-secreting cyst lying on the anterior surface of the anterior maxilla beneath the upper lip and projecting submucosally into the floor of the nose beneath the anterior end of the inferior turbinate, was first described by Zuckerkandl[2] in 1882.

The subsequent literature has been excellently reviewed by Schroff,[3] who found over 60 cases reported to 1929. Ages varied from 19 to 58 years; all but three cases occurred in females, and in one instance bilateral cysts are recorded. No instance of a malignancy occurring in these cysts was reported.

Since that time additional cases have been reported by Schmidt,[4] Thoma[5] and Roper-Hall.[6]

The etiology has been variously ascribed to: *A.* Simple retention cyst:[7] This seems unlikely in view of the constant anatomical position and some variation in lining epithelium. *B.* Developmental anomaly of the nasolacrimal duct:[8,9] This also seems unlikely since, according to Schroff, Klestadt's serial sections of 23 embryos showed that the nasolacrimal duct never reached the floor of the nose.[10] Furthermore, any possibility of origin from the nasopalatine duct is considered remote because the duct is medial near the septum and considerably posterior to the vestibule of the nose. *C.* Embryological epithelial rests of the facial cleft area: This is the view generally accepted by such writers as Klestadt,[10] Huizinga,[11] Doring[12] and Thoma.[5]

In explaining this process Schaeffer[13] describes the early development of the nose as follows: The characteristic epi-

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thelium of the nasal areas is recognizable as early as the third week of embryonal life as bilateral placodes which become passively depressed during the fourth week, forming nasal pits separated by a broad mass of tissue, the frontonasal process. The deepening nasal pits then separate this mass into medial and lateral nasal processes (see Fig. 1).

During the latter part of the fourth week the median portion of the frontonasal process is differentiated to form two laterally placed globular processes (see Fig. 2).

The maxillary portion of the first or mandibular arch grows across from below the nasal pit, fusing with the lateral nasal process; secondarily the lateral and medial nasal processes (globular part) fuse, forming the definitive inferior boundary of the nose (see Fig. 3).

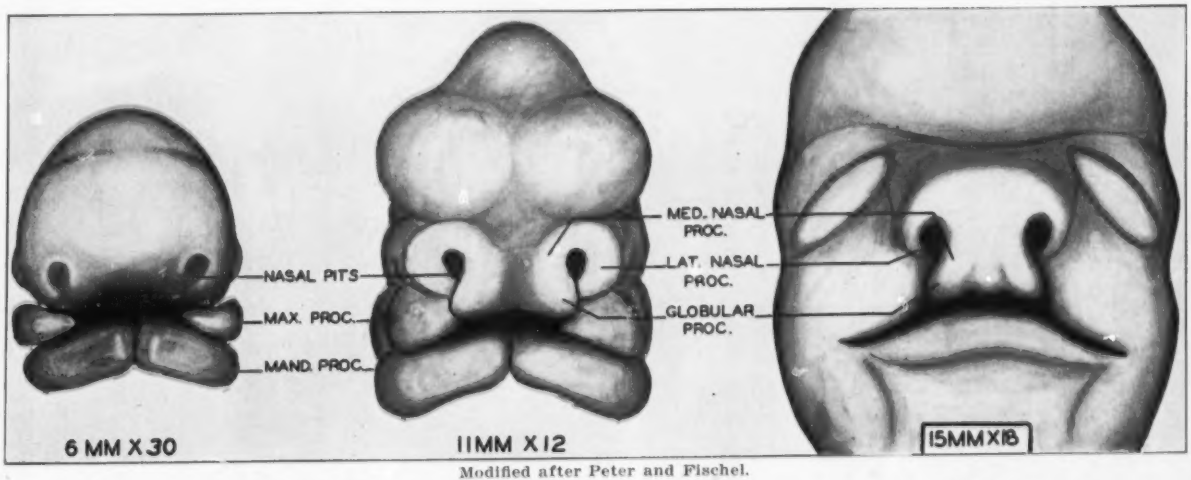
Schaeffer states: "For a brief time the lines of fusion of maxillary and lateral nasal processes with the medial nasal processes are represented by strands of ectodermal tissue which . . . soon disappear . . . and mesenchymal tissue of the maxillary and lateral nasal processes becomes continuous with that of the medial nasal processes. Persistent epithelial cell masses may later in extrauterine life, or before, give rise to epithelial pearls and cysts."[13]

The fused cleft referred to by Schaeffer comprises in the adult that area lying between the lateral upper incisor and canine teeth and extends backward into the floor of the nose beneath the anterior end of the inferior turbinate.

According to Roper-Hall "the premaxillary region is a center of intense developmental activity, the meeting place of several fissures, including the incisive canal, and is the site of the lateral incisor, which is itself liable to many vicissitudes complicated by its own emergence from a posterior and almost horizontal position to a nearly vertical position and also by the fact that one lateral incisor in the mammalian formula has been suppressed; there is opportunity for the development of cysts here which are not necessarily of dental origin."[6]

The present series of five cases were all in females between the ages of 37 and 56 years.

The presenting complaint was nasal congestion varying from mild stuffiness to complete occlusion. In four instances



Modified after Peter and Fischel.

Fig .1. Fig. 2. Fig 3.

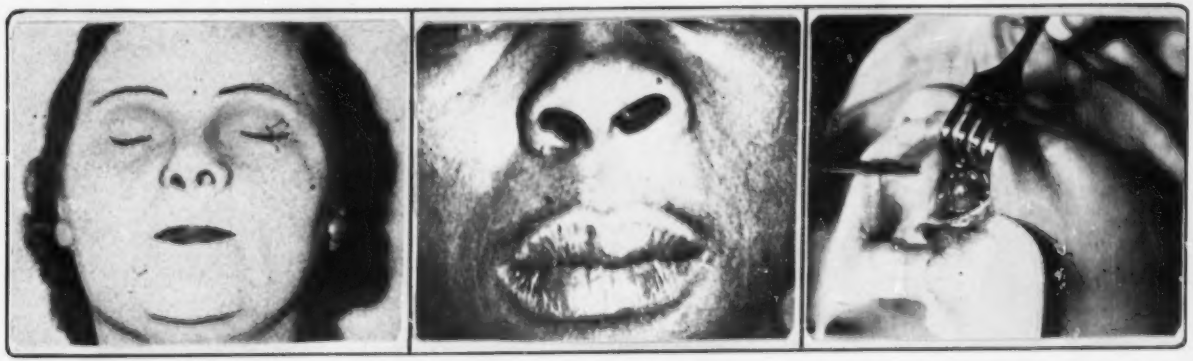


Fig. 4. Fig. 5. Fig. 6.

fullness beneath the nasal ala and obliteration of the nasolabial fold was also noticed (see Fig. 5), and one patient stated that the cyst enlarged and became somewhat painful with her menstrual periods; pain otherwise was remarkably absent.

Examination in all cases revealed a smooth, rounded, cystic, mucosa-covered swelling arising beneath the anterior end of the inferior turbinate in the vestibule of the nose beneath the mucosa at about the mucocutaneous junction (see Fig. 4).

The anterior end of the inferior turbinate was displaced varying distances towards the septum, depending on the cyst size.

Palpation of the anterior surface of the maxilla beneath the upper lip revealed the fluctuant lower margin of the cyst, and the cystic character was readily confirmed by ballottement between a cotton-tipped probe in the nose and the examining finger. This very useful diagnostic maneuver was employed by Vogel.[8]

Dental and facial bone Roentgenograms were taken in four instances and characteristically revealed no significant abnormalities.

All cysts were removed surgically, the patients being prepared exactly as though for a Caldwell-Luc antrotomy, and, after local infiltration of the gingivolabial fold with novocain, a somewhat medially placed Caldwell-Luc incision was extended through the mucosa from the frenum to the first bicuspid.

Just beneath the mucosa the clear, thin, glistening cyst lining was encountered (see Fig. 6) and easily freed from the surrounding tissue by gentle blunt dissection; however, in the small cup-like depression characteristically created in the anterior maxilla at the nasal vestibule, each cyst was rather closely adherent to the underlying periosteum, and at the point where cyst wall approximated the floor of the nose, fusion was so firm that occasionally it was necessary to remove a section of the nasal mucosa in order to entirely eradicate the cyst wall.

In two instances a small labial branch of the infraorbital division of the maxillary nerve was found closely applied to

cyst wall but was freed and retracted. Removal of any bone was unnecessary since the cyst merely rested on the surface of the maxilla. Following the removal of the cyst, the operative site was thoroughly irrigated with normal saline, the defect in the nasal mucosa if present was closed with fine catgut and the gingivolabial incision similarly treated without drainage. All wounds healed per primum. All patients are well and without recurrence at the present time.

The cyst content in four instances was a thin, milky mucus, which in the two cases cultured was sterile.

The fifth cyst contained a thin, brownish, foul-smelling fluid, which unfortunately was not cultured, but which probably was the result of hemorrhage into the cyst.

Microscopic sections revealed either a columnar or cuboidal type of epithelium, frequently ciliated, occasionally stratified to two or three layers containing numerous mucous-secreting cells. There was a small amount of underlying connective tissue with a few adherent muscle fibers.

DISCUSSION.

The differential diagnosis of cystic lesions occurring laterally in the nasal floor and maxilla about the canine or lateral incisor teeth lies between four conditions, two of which are dental in origin: *1.* Dental root cyst, or *2.* Dentigerous cyst; and two which are fissural in origin: *1.* Globulomaxillary cyst, or *2.* Nasoalveolar cyst (see Fig. 7).

DENTAL ROOT CYST.

Dental root cyst, dentoperiosteal cyst, or radicular cyst, is a cystic lesion which may be found about the apex of any tooth root as a result of an apical granuloma. It consequently is filled with pus or necrotic debris and is lined with squamous epithelium over a thick fibrous submucosa.

Pulp tests such as heat and cold reveal a nonvital tooth, and pain is usually present at some time.

The lesion is within the maxilla, and Roentgenograms reveal an area of radiolucency about the root apex, frequently

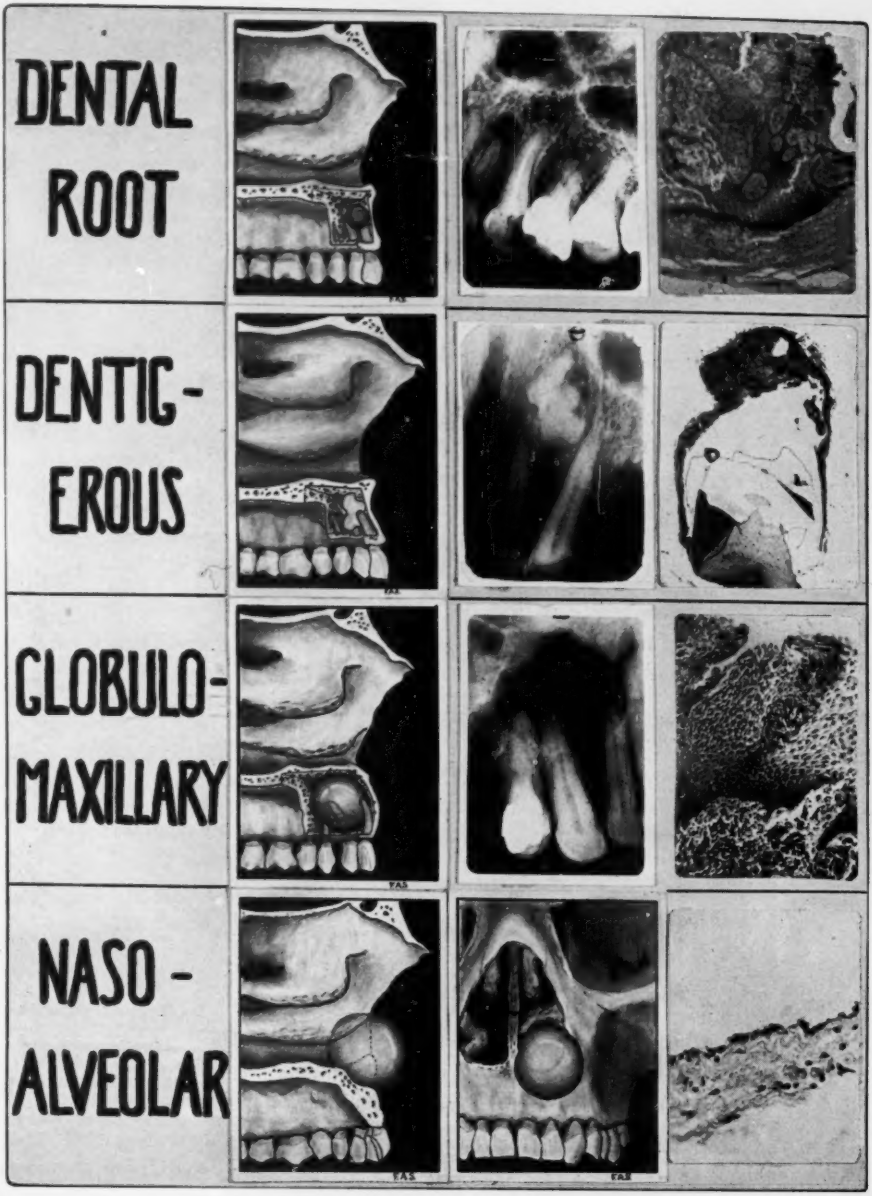


Fig. 7.

a root canal filling, and the position of the adjoining roots usually is not disturbed.

Treatment consists of extraction of the involved tooth and removal of the cyst and lining.

DENTIGEROUS CYST.

Slowly enlarging dentigerous cysts arising from anomalous tooth development are readily differentiated because they include the crown of a tooth or an anomalous tooth within a cystic space lined by low pavement squamous epithelium.

These cysts may occur about any tooth but anomalous dentition is particularly frequent in the area under discussion, as was shown by Roper-Hall,[6] who found 202 out of 301 supernumerary teeth in the lateral incisor-canine area, and states "supernumerary teeth often become cystic."

The involved tooth may or may not have a vital pulp, depending on the size and relationship of the cyst to the root. Pain in the absence of secondary infection is infrequent.

The lesion starts within the maxilla but may reach considerable size presenting in the nasal cavity, antrum or beneath the cheek.

Dental and facial bone Roentgenograms are diagnostic, revealing a large radiolucent area in the bone containing either crown or anomalous tooth; the position of the adjoining roots and teeth is dependent usually only on the cyst size.

Treatment consists of surgical removal including the lining, through anterior maxilla, palate or antrum, depending on size and point of presentation.

The frequently cystic, though embryologically more primitive, ameloblastoma (adamantinoma, adamantinoblastoma), is, according to Robinson[14] "different radiographically because it produces a lobulated area or scalloped bordered area and its microscopic appearance is quite characteristic."

GLOBULOMAXILLARY CYST.

The Globulomaxillary cyst is considered as arising from epithelial rests trapped *between* the globular and maxillary

processes in contradistinction to the nasoalveolar cyst which arises from rests *anterior* to these processes.

The lining is usually stratified squamous, but columnar has been found,[6] and cyst fluid varies from this, serum-like, straw-colored material to frank pus from secondary infection.

These cysts always arise in the maxilla between the lateral incisor and canine and by their enlargement produce the very characteristic separation of the lateral incisor and canine roots seen Roentgenologically, with an oval or heart-shaped area of radiolucency between the diverging apices.

The roots need not be involved by the cyst, and pulp tests may show vital teeth in the absence of other dental disease.

An eggshell-like crackling to palpation over the cystic swelling due to thinned bony cortex of the maxilla in larger cysts has been described,[6] but tenderness due to secondary infection seems more frequent.[14,15]

The treatment is surgical and varies from simply making a fistulous opening into the cyst from the labial margin[6] to allow drainage, to radical removal of incisor, canine, cyst and lining from the palatal side.[6,14,15] This latter method is less radical in view of the difficulty of removing cyst without devitalizing these teeth.

NASOALVEOLAR CYST.

Nasoalveolar cyst is distinguished by its anterior position and hence is sometimes referred to as an anterior cyst. The absence of dental or bone changes, the soft cystic character with cystic projection beneath the anterior end of the inferior turbinate and beneath the lip, are diagnostic. It is always superficial to the lateral incisor and canine teeth, is usually found in females and, in rare instances, is bilateral. In the absence of infection the content is clear, thin, milky mucus, and the lining varies from cuboidal to ciliated columnar.

For the sake of completeness one should mention incisive canal cysts which are thought to arise by a similar process and are located in the *midline* of the *palate behind* the teeth.

There may be either a swelling at the oral end of the incisive canal which is designated as a cyst of the palatine papilla,

or a cystic enlargement within the canal which constitutes the true incisive canal cyst (nasopalatine cyst) that is readily diagnosed by occlusal Roentgenograms but otherwise is frequently overlooked.

CASE REPORTS.

Case 1: E. S., a white woman, age 43, entered the University of California Out-Patient Department, Feb. 11, 1942, complaining of a nasal congestion of six weeks' duration. Examination revealed a large cyst in the right inferior meatus pushing the inferior turbinate towards the nasal septum, and the lower margin could be palpated beneath the upper lip.

Kahn negative, 1940.

X-ray, Feb. 27, 1942: No definite evidence of supposed dental cyst; the right nasal fossa is rather dense; this could be due to enlarged turbinates.

Dental Consultation: No dental abnormalities; front teeth are vital.

Operation: Patient was taken to surgery on March 2, 1942, and under novocain locally a gingivolabial incision was made through the mucosa as though for a Caldwell-Luc antrotomy, and a thin, glistening cyst measuring 2 cm. across was freed from the surrounding tissue but was so adherent to the overlying nasal mucosa that a small segment of this had to be removed to extract the cyst.

After irrigation a small cup-like depression was seen in the anterior maxilla between the lateral incisor and canine teeth at the lower anterior rim of the bony nasal floor. The cyst contained about 3 cc. of sterile, thin, milky, odorless mucus.

The nasal mucosa and the incision were closed with fine catgut, and a pressure dressing applied. Healing was by first intention, and patient stated her nasal congestion was much improved postoperatively.

Pathological Report: Specimen consists of a 2 cm. x 1 cm. x 1 mm. piece of soft cyst lining. Microscopic section shows a single layer of a cuboidal or low columnar epithelium with occasional goblet cells. In some areas the epithelium is one layer thick, in other areas it is stratified. There is smooth muscle and connective tissue making up the body of the section.

Diagnosis: Nasoalveolar cyst.

Case 2: S. C., A white woman, age 56, entered the University of California Out-Patient Department, Feb. 26, 1942, complaining of mild nasal congestion of an indefinite duration and some unrelated deafness and tinnitus. Examination showed a large cystic swelling beneath the anterior end of the left inferior meatus in the floor of the nose which was palpable and ballotable beneath the upper lip at the upper end of the nasolabial fold.

Dental Consultation: No nonvital teeth.

X-ray: All sinuses clear; no bony abnormalities evident.

Operation, May 13, 1942: Similar approach and dissection revealed a 2 cc. cyst which was freed from the maxilla and nasal mucosa, leaving a small cup-like depression in anterior maxilla.

The cyst contained 2 cc. of sterile, thin, white, milky mucus, but unfortunately the specimen was mislaid before sections could be taken.

Diagnosis: Nasoalveolar cyst.

Case 3: L. I., A white woman, age 45, entered the University of California Out-Patient Department, Aug. 4, 1942, complaining of a "painful knot on the right side of the nose." Examination revealed a small palpable cyst at the right ala nasi, slightly tender, and no intranasal projection was seen.

X-ray examination, Aug. 5, 1942, revealed no bony involvement of maxilla on either side and the sinuses were clear. Dental X-rays revealed no significant abnormality.

Operation, Aug. 7, 1942, revealed a 1 cm. cyst with the customary dimple in the anterior maxilla and extension beneath the inferior turbinate. Recovery was uneventful.

Pathological Report: The cyst had a dense fibrous tissue covering with interstitial mononuclear infiltration. The cyst wall was lined with tall columnar pseudo-stratified epithelium with basal nuclei. This was incomplete over some areas and instead there was a thin mesothelial covering.

Diagnosis: Nasoalveolar cyst.

Case 4: M. H., a 42-year-old white woman entered Barnes Hospital Out-patient Department, Aug. 10, 1942, complaining of a "sore swelling on the right side of the nose," which was of a year's duration and enlarged with her menstrual periods. Examination revealed a 3 cm. tense, fluctuant cystic swelling extending beneath the right inferior turbinate and on the anterior surface of the right maxilla beneath he right ala nasi.

No X-ray examination was made because the lesion was clinically typical.

Operation, Aug. 18, 1942, was typical as to the nasal extension and depression in the maxilla, but a small labial branch of the infraorbital nerve had to be freed from the nasal side of the cyst before it could be removed. Cyst content was inspissated yellow, sterile mucus.

Pathological examination revealed a dense fibrous stroma with a thin lining varying from low cuboidal cells to pseudo-stratified columnar ciliated epithelium and frequent mucus or goblet cells.

Diagnosis: Nasoalveolar cyst.

Case 5: M. I., a colored woman, age 37, entered Barnes Hospital Out-Patient Department, March 17, 1943, complaining of complete occlusion of the right nostril by a swelling of one year's duration. This enlarged intermittently but bore no relation to her periods since they had been artificially terminated. Examination revealed a 3 cm. cystic swelling arising beneath the right inferior turbinate extending out on the anterior surface of the right maxilla beneath the right ala nasi. This almost completely occluded the nostril.

No X-rays were taken because of the clinically typical lesion.

Operation on May 20, 1943, revealed a 2½ cm. cyst with a slightly thicker wall than usual and contained thick, brown, foul-smelling fluid which was not cultured.

A small defect in the nasal mucosa was closed, and the usual dimple in the anterior maxilla noted. The wound was closed and healed by first intention.

Pathological examination revealed a dense fibrous stroma with a pseudo-stratified columnar ciliated epithelium giving way in patches to

low cuboidal or endothelial type of lining. There is some round cell infiltration in the submucosa.

Diagnosis: Nasoalveolar cyst.

SUMMARY.

The history, etiology, pathology and five cases of an interesting cystic developmental anomaly of the anterior facial area has been presented with a discussion of the differential diagnosis and treatment.

N. B.: The term maxilla used throughout this paper includes both the premaxilla and maxilla as the fused bone.

The writer wishes to express his gratitude to Dr. H. B. G. Robinson, of the Washington University Dental School for his extensive help in the dental problems presented, for the clinical illustrations of dental lesions, and those of the globulomaxillary cyst previously reported;[14] also to Dr. Robert W. Godwin, of the Department of Otolaryngology of Washington University Medical School, for Case 5 and the photography.

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TRAINING FOR OPTIMUM USE OF HEARING AIDS.*

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An almost universal complaint of *seasoned* users of hearing aids is that understanding of speech through the instrument is often limited and obfuscated although perception of sound, as such, seems to be adequate. The present investigation is an attempt to test the premise that the inability on the part of users of hearing aids to respond adequately to auditory language stimuli can be ameliorated, to a certain extent, by a period of systematic acoustic training.

Many workers in the past have enunciated and implemented the principle of teaching through auditory stimulalation, not only partially deaf but also profoundly deaf children to achieve differentiation of elements of speech, understanding of words and connected spoken language, depending on the degree and character of hearing loss.

As far back as 1761 Ernaud,[1] claiming that every deaf child could benefit by some form of acoustic stimulation, demonstrated auditory appreciation, after a period of training, in a selected class of deaf children. Pereire,[2] Itard,[3] Toynbee,[4] Blanchet,[5] Gillespie,[6] Urbantschitsch,[7] Goldstein,[8] The Ewings[9] and others were enthusiastic about the possibilities of this form of approach. Goldstein,[10] in 1921, presented a system of training designed to guide teachers in making optimum use of whatever residual hearing was extant in so-called deaf children. The training of residual hearing of children is at present generally incorporated in the curricula of schools for the deaf. The children are thus led to an appreciation of speech which was not present prior to training.

The present report, however, is concerned with hypacusic adults whose understanding of speech, naturally acquired, has been distorted. Such distortion is partially overcome by the use of hearing aids, but it has been suggested by Senturia, Silverman and Harrison,[11], Guggenheim[12] and

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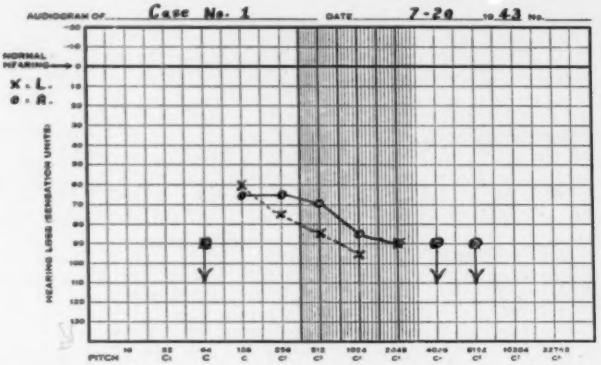
Goodfellow[13] that cerebral reorientation to speech transmitted through a hearing aid can be improved by systematic acoustic training.

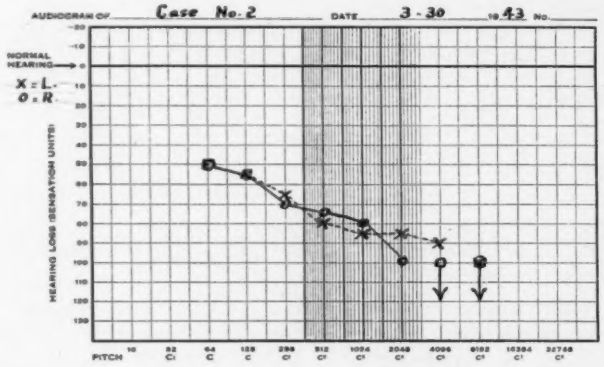
PROCEDURE.

Seven users of hearing aids who had acquired understanding for speech naturally prior to the onset of a hearing loss volunteered for a period of acoustic training. A basic criterion for inclusion in the experimental group was that the individual should have worn his aid regularly for more than a period of one year. This precaution was taken so that any improvement that might result would be due to the training program and not to the improved understanding for speech that would likely have been brought about by routine accommodation immediately after acquisition of an instrument. It was felt that after a period of one year the hearing aid user had reached the point of optimum routine adjustment and accommodation to his speech milieu and his instrument. The length of time which the subjects had used hearing aids ranged from two years to 30 years. The shortest length of time which the last aid purchased had been used was 1½ years. The age range of the subjects was from 24 to 65 years.

Prior to and after the training period the subjects wearing their hearing aids, were tested individually for perception of words and sentences. An adaptation of the word test developed by Thea,[14] which includes the elements of English speech in their various relationships, and 25 sentences from the Fletcher-Steinberg[15] articulation test sentences were used. The test items, incorporating male and female voices, were presented to the subjects on electrical transcriptions with a frequency response of 100 to 9,000 cycles per second with a background noise of less than 55 dcb. below recorded level. The transcriptions were reproduced using an electrical turntable revolving at 33⅓ revolutions per minute. The reproducer is of the crystal type imposing a needle pressure of 35 gm., and is mounted on a broadcast type reproducer arm. It is connected to the amplifier through a special equalizer, which possesses mirror characteristics similar to those used in recording the special test electrical transcriptions. A dual speaker system mounting two concert-type Jensen electrodynamic speakers in an appropriately designed cabinet which has adequate baffling to provide uniform response to 50 cycles

per second completed the test apparatus. The chair in which the individual was seated during the tests was located so that the ears and hearing aid were two meters from, and at right angles to the calculated points of the source of sound. The test room has average residual noise level of 35 dcb. above



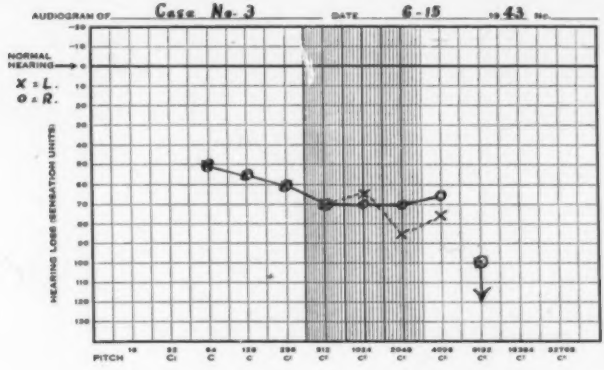


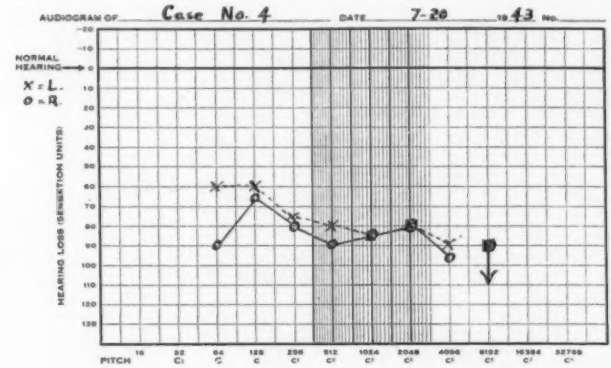
absolute threshold with reverberation time (time required for a 1,000-cycle tone to attenuate 60 dcb. or to 1/1,000,000 of its original value) of one second.

The subjects reported for training lessons two evenings per week for a period of 10 weeks. Each lesson lasted one

hour. The following principles were considered in constructing and presenting the training material:

1. Speech was presented from electrical transcriptions employing the equipment previously described, which eliminated the possibility of lip-reading.



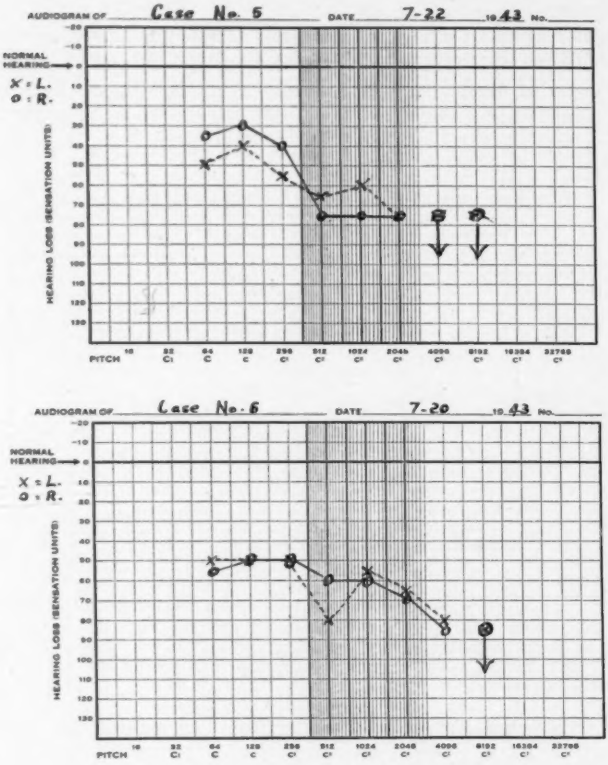


2. A lesson consisted of:

a. A series of words incorporating a given element of speech in various relationships. During the latter half of the training period these elements were contrasted with other elements of speech (in words) with which they were likely

to be confused. The factor of contrast was introduced in order to facilitate sensory analysis of auditory stimuli.

b. A series of unrelated sentences requiring the exercise of synthetic ability to utilize auditory clues to facilitate understanding.



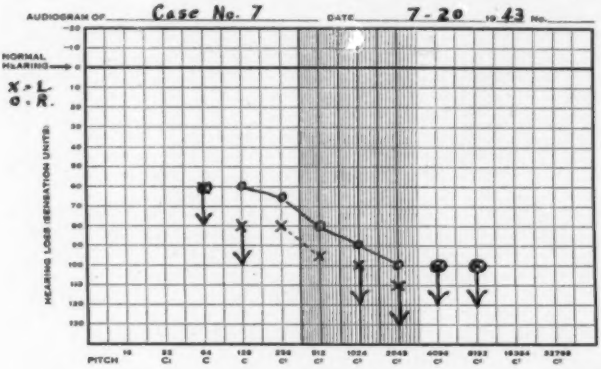
c. Connected passages requiring further synthesis and cerebral organization of auditory language stimuli.

3. The subjects were furnished complete scripts of the material in order to form associations between the known (the script) and the partially distorted (the speech emanating from the speaker). Since the words, sentences and con-

nected material were each presented four times, the subjects were given an opportunity to cover the material, as they chose, to see how well they could respond without the script. Then by referring to the scripts they could evaluate their own performance.

4. A variety of untrained male and female voices was used in recording the material since hearing aid users must learn to accommodate to all types of speech.

5. Since wearers of instruments must adjust to normal patterns of social communication, no attempt was made during the training period to keep the room extremely quiet. As a matter of fact windows were kept wide open purposely,



which introduced the noises of heavy traffic and conversation from the corridors. This factor disciplined attention to the stimulus, and presented opportunity for training in disregarding masking sounds.

6. Individual differences in auditory thresholds as represented by the accompanying pure-tone audiometric threshold measurements were taken into consideration in placing the subjects in the room during the lesson. Regulation of potentiometers on the instruments further enabled the trainees to place themselves in a situation where the speech was barely perceptible.

7. The factor of practicability made it necessary to teach the group together since a secondary aim of the study was

to demonstrate a technique where large groups could be trained at one time.

RESULTS.

Table 1 indicates that six of the seven subjects showed some improvement in the understanding of speech as a result of the acoustic training. The one case in which no improvement was indicated involved a subject who began with no appreciation of speech through a hearing aid. The gains for

TABLE. 1. IMPROVEMENT IN UNDERSTANDING OF WORDS AND SENTENCES RESULTING FROM SYSTEMATIC ACOUSTIC TRAINING.

			Pre-Training Test Scores (Percentage)				Post-Training Test Scores (Percentage)				Improvement Percentage			
			Words		Sentences		Words		Sentences		Words		Sentences	
Case No.	Age	Years used hearing aid	Male*	Female*	Male*	Female*	Male*	Female*	Male*	Female*	Male*	Female*	Male*	Female*
1	24	2	0	0	0	0	0	0	0	0	0	0	0	0
2	34	5	24	24	52	20	36	28	68	56	12	4	16	36
3	37	4	52	72	76	64	64	72	88	96	12	0	12	32
4	50	10	56	52	48	48	72	84	64	80	16	32	16	32
5	50	8	32	32	24	4	56	68	48	56	24	36	24	52
6	51	4	52	64	40	60	64	72	48	68	12	8	8	8
7	65	30	4	12	12	28	32	32	64	36	28	20	52	8

*Voice used on test.

understanding of words ranged from zero per cent to 36 per cent with significant improvement in most instances. The improvement for understanding of sentences ranged from 8 per cent to 52 per cent with appreciable gains in most cases.

Since the pre- and post-training conditions were held constant, the post-training tests revealed actual change in speech perception as measured by the tests previously described.

The evidence suggests that a period of systematic acoustic training for hearing aid users is desirable after the acquisition of an instrument. The experimental techniques described should be repeated with a larger number of cases to further substantiate the findings of the present study. It is conceivable that the training procedure involving group instruction might be employed by organizations serving the hypacusic adult in the same manner in which lip-reading classes are carried on. Further investigation is suggested to deter-

mine what type of material yields optimum results for improvement in cerebral reorientation to the understanding of speech.

SUMMARY.

1. The purpose of the study was to test the premise that understanding of speech by seasoned users of hearing aids could be improved through systematic acoustic training.

2. Techniques and equipment for carrying on such a program with groups of hard-of-hearing adults were described.

3. Six or seven subjects showed appreciable gains in understanding of speech as a result of the training program.

The writer is indebted to the St. Louis League for the Hard of Hearing for furnishing subjects for this study.

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A REVIEW OF THE ARTICLES ON TUBERCULOSIS IN THE FIELD OF OTOLARYNGOLOGY CHIEFLY FOR LATE 1942 AND EARLY 1943.

DR. FRANK R. SPENCER, Boulder, Colo.

During the past four years there has been a very steady decline in the number of articles published in medical journals all over the world. There has also been a decline in quality as well as quantity because of the difficulty of doing research in time of war. This is inevitable after four years of a worldwide conflict.

For the past few years there has been a decided increase in the number of articles, in all countries, about tracheobronchial tuberculosis with fewer articles dealing with laryngeal tuberculosis. The pendulum has swung almost too far from the upper to the lower respiratory tract. This, however, has increased our knowledge, gained by peroral endoscopy, with the result that diagnosis and treatment have shown marked improvement.

Some foreign medical journals cannot be obtained in any of the libraries of the United States, so that the abstracts of the French, German and Italian cannot be submitted. These will be abstracted and published later if and when the journals can be obtained.

Hulse[1] has emphasized the "wet" and "dry" types of tuberculosis. He believes the "wet" arouses suspicion earlier than the "dry." The "wet" may be ushered in by a prolonged stubborn cold or what is mistaken for a cold. He finds the history important especially so far as contacts are concerned. The temperature chart gives valuable information and often shows the rather typical low morning temperature with fever in the afternoon. A trace of albumin in the urine may not be very important as a single symptom, but it may be helpful in making the diagnosis.

Hulse found an atrophic nasal mucous membrane in the

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late stages of tuberculosis. Biopsies proved the histopathology of atrophy.

He calls attention to the importance of hoarseness even when laryngeal tuberculosis cannot be demonstrated. He mentions the pressure of the pulmonary tubercles on the inferior or recurrent laryngeal nerves particularly in the apices and often on the right side. A paresis or a paralysis may explain the hoarseness. Coughing, profuse bronchial secretions, irritation, etc., may account for the hoarseness. Rales also constitute an important symptom in the chest.

Hulse's paper emphasizes important points for the laryngologist to keep in mind because the otolaryngologist may be the first physician consulted. The early diagnosis may be converted into a late one by failure to exclude pulmonary tuberculosis in prolonged and severe colds, hoarseness, fever, fatigue, etc.

This paper contains very little which is new, but the advice is timely and to the point.

Laff[2] believes bronchostenosis is really the "stepchild" of medicine because until recently it has gone unrecognized. Foreign bodies, granulations, neoplasms, inflammatory lesions, etc., engrafted upon the bronchial walls may be responsible for the various valve-like mechanisms causing massive or lobar atelectasis, obstructive emphysema, drowned lung, bronchiectasis, etc. He emphasizes the importance of examining these lesions by peroral endoscopy, even in the tuberculous, for diagnosis and treatment. Tuberculous patients tolerate endoscopy well.

The lesions in the trachea and bronchi are comparable to those found in the larynx, but do not always exist at the same time. The most important lesion is the extensive granulating ulcer, often in the main bronchus and frequently causing complete stenosis. A tuberculoma produces less obstruction.

Laff discusses in his paper the importance of scars with subsequent contractions and resulting stenosis. He compares these with the results obtained by pneumothorax, thorocoplasty, phrenectomy, etc. Asthma, bronchostenosis, atelectasis, smears, cultures, bronchoscopy for diagnosis and treatment all receive careful consideration in the paper. He

believes bronchoscopy is safe and should be used for the healing of early tracheobronchial lesions to avoid stenosis.

The paper is very complete in every detail.

Iglauer[3] presents a very practical explanation of the surgical anatomy of the pharynx and neck as an introduction to his report. His anatomical diagrams illustrate the important points he emphasizes. He calls attention to the importance of the frequency with which the retropharyngeal lymph node becomes infected with pyogenic organisms and even with tubercle bacilli. The former usually produce an acute disease and the latter a chronic one. He has excluded caries of the vertebrae as a cause of the tuberculous "cold" abscess.

He gives a detailed report of a 44-year-old veteran of World War I who had a diagnosis of pulmonary tuberculosis in 1924. On Feb. 13, 1940, the patient had a swelling, the size of a hen's egg, in the left half of the pharynx extending from the nasopharynx to below the level of the epiglottis. The mass fluctuated and had thin walls. On Feb. 18, 1941, the abscess was aspirated with a long needle. Three ounces of pus were removed. On Feb. 23, 1941, death occurred, apparently as a result of spontaneous pneumothorax. At autopsy the large abscess cavity was opened. The pathologist found the histopathology of tuberculosis, but no tubercle bacilli. A guinea pig experiment was positive for tubercle bacilli.

The author believes this type of abscess rarely reaches the mediastinum. He prefers the term peripharyngeal abscess in distinction to those which are retropharyngeal. His points are well substantiated by practical anatomy, clinical knowledge and experience. His article is worth reading in its entirety.

Phelps[4] believes there is agreement among physicians about the symptoms and diagnosis of tracheobronchial tuberculosis, but that there are too many different opinions about treatment. He has found the pulmonary disease more important than the bronchial. The earliest lesions are but rarely seen through the bronchoscope, but when granulations form, there is obstruction to breathing. The miliary tubercles are found at autopsy but only rarely during life. The bronchial lesions may persist after the pulmonary lesions have healed or become

arrested. Wheezing and dyspnea suggest bronchial obstruction. Phelps found that bronchoscopic examination confirmed the clinical and X-ray diagnosis in about 75 per cent of his cases. Eighty per cent of his cases had proved bronchiectasis. He only recommends bronchoscopy in selected cases, not as a routine procedure. He treats ulcerostenosis with 30 per cent silver nitrate. Granulations are removed with cutting forceps. Dilatation of fibrotic stenosis had not been satisfactory. After five years 31 per cent of the patients are dead, 63 per cent have chronic disease and 6 per cent are well.

The author discusses some of the important signs and symptoms leading to a diagnosis of tracheobronchial tuberculosis. He mentions some important methods of treatment and shows quite frankly the results of treatment after five years.

Belfort[5] believes tuberculosis of the trachea and bronchi is a specific infection of the mucosa and submucosa. The frequency is quite high, but the symptoms are less severe than those of the lungs and larynx. He reviewed 1,236 cases of pulmonary tuberculosis and found only 99 had tracheobronchial tuberculosis. Eighty of the 99 had laryngeal tuberculosis also. The trachea and bronchi are not the sites of primary tuberculosis, but are secondary to pulmonary. When small tubercles fuse to form larger ones, ulceration is likely to result. The cartilaginous rings may be perforated as the tubercles often form between the rings. The tuberculomata produce obstruction.

The symptoms are not marked and are not numerous. Biopsy helps to complete the differential diagnosis of tuberculosis, syphilis and carcinoma. The bacteriological study also helps.

The author reviews some of the better known characteristics of the disease, but he adds nothing new.

Acuna[6] reviews the importance of bronchoscopy in pulmonary tuberculosis. The symptoms are enumerated, as listed in the literature, and these are described for the trachea and bronchi. The diagnostic and therapeutic importance of bronchoscopy is emphasized. The results of 50 bronchoscopies at the Sanitorium in Huilpulco are given. The article adds 50

more cases to substantiate the importance of bronchoscopic examination.

The paper is to the point, but it contributes nothing new.

Engler[7] quotes in detail 19 authors regarding Roentgen-ray therapy. Winkler used the X-ray as early as 1904 to relieve the pain and heal the lesions. Fractional dosage is more universally favored to lessen the dangers of laryngeal edema and necrosis of cartilage. Engler's radiologist, Harry Hauser, lists the dosage used for the tuberculous patients.

The results of treatment for 38 patients are given. These are not selected cases. Of these, eight patients are cured, six show improvement, eight are unchanged, and 16 are definitely worse. Six of the author's cases are reported in some detail. In the summary and conclusions, 14 points are emphasized. The author believes a larger series would have shown better the advantages and disadvantages of Roentgen-therapy.

The article is fairly complete and it emphasizes one important method of treatment.

Cemach[8] believes irradiation should be more universally used than it is. He has a special lamp to facilitate the treatment. This is a small curved mercury lamp which can be easily introduced into the larynx. It can also be used in the mouth and pharynx. The penetration of the light rays is superficial, so that only superficial lesions of the mucous membrane, such as ulcers, can be treated. Deep ulcers involving the cartilage are more resistant. Odynphagia becomes less severe. The cautery should supplement the light treatment for deeper lesions.

The reviewer believes too many laryngologists have lightly brushed aside any and all forms of light treatment without first giving them a fair trial. Too much is expected from a few treatments and in too short time. Irradiation is not, and never has been, a "cure all," but it deserves more credit than it receives. The article is a good one, although not new.

Berberich[9] found tuberculosis of the mouth rare even in patients with pulmonary tuberculosis. The lesions of the oral cavity are the same as those seen in the larynx. He believes the disease is very rarely primary. The standard methods

of treatment, as used for laryngeal tuberculosis, may be used in the oral cavity.

Berberich was a former associate in the clinic of Nussbaum and Teebrugge where carbon dioxide snow was used and he had followed their cases for seven years. Large lesions should be first curetted and then frozen. The freezing usually has to be repeated in two weeks. A third freezing is less often required. The lesions heal promptly and leave very little scarring.

Carbon dioxide is allowed to flow into a chamois cloth, a leather bag or one made of oilcloth. Dry snow is formed at — 57° C. This is mixed with acetone, using a wooden tongue blade. A pulp forms with a temperature of — 90° C. The lesion is anesthetized with cocaine, pontocaine or novocaine, but without adrenalin, and the snow pulp applied to the lesion with the wooden tongue blade for five or six seconds. As soon as the previous color has returned the snow is applied a second time. The snow should be firmly held in place against the lesion.

The healing takes place in two weeks and is very much like that following cauterization. He used this for more than 200 cases. The method of treatment is simple and easy to use.

The entire article is worth reading. This method of treatment should be used for the larynx and the oral cavity. It is much easier to use in the mouth. It is a valuable addition to other and older methods of treatment.

Brantigan and Hoffman[10] illustrate their article with an anatomical dissection of the sensory nerve supply of the larynx. They found the injection of alcohol into the superior laryngeal nerve was not always satisfactory in advanced ulceration of the larynx and subsequent injections were even less so. They use partial section of the superior laryngeal nerve on each side and like this better. Unilateral section may fail to relieve the pain. Complete bilateral section is followed by excessive aspiration of food and water. They describe the technique used by them for this operation.

The article is brief and to the point, but not new.

Clerf[11] refers in his article to the classifications of the lesions in tuberculous tracheobronchitis as previously given

by Samson and Myerson. He discusses the lesions found and the pathogenesis, such as the nonulcerative, nonstenotic or infiltrative lesions, the hyperplastic granulomatous or tuberculomatous and ulcerative lesions.

He examined in his series 177 patients and found 48 instances of demonstrable tuberculous lesions, or 27 per cent. This complication of pulmonary tuberculosis was more common in women in his series of cases. The ulcerogranulomatous cases numbered 23. There were seven cases of ulcerogranulomatous lesions with cicatricial stenosis and 11 cases of cicatricial stenosis.

The use of the cautery, surgical diathermy, ultra-violet light therapy, silver nitrate, etc., are discussed. He found 5 per cent silver nitrate better than the stronger solutions. He dilated some of the stenoses of the bronchi. There are two illustrations of chest films in the article.

Clerf's paper is well worth reading, because his results are good. His mature judgment and experience give great weight to his observations.

Benedict[12] describes the three important lesions of tracheobronchial tuberculosis as ulcerative, hyperplastic and stenotic. He finds the symptoms, which indicate a bronchoscopic examination, to be obstructive signs, such as atelectasis, wheezing, difficulty in raising sputum, persistent cough or dyspnea, intermittent febrile attacks, positive sputum, hemorrhage, unexplained parenchymal disease, etc. Some patients following thoracoplasty require bronchoscopic aspiration of secretions with bouginage. He emphasizes the importance of the clinical history, X-ray films of the chest, the general physical examination, laboratory examinations, etc.

The paper contains 15 case reports from the Massachusetts General Hospital, with 22 illustrations. The latter include 17 chest films. In conclusion Benedict finds carcinoma, benign tumor and tuberculosis the three most common causes of bronchial obstruction.

The article is very complete and very instructive. It is worth reading in its entirety. It is in keeping with the excellent work being done at the Massachusetts General Hospital and the Massachusetts Eye and Ear Infirmary.

Cohen and Koepcke[13] review briefly the history of tuberculosis of the middle ear and mastoid. Their article is based

upon their observations at the Glen Lake Sanitorium at Oak Terrace, Minn., from 1924 to 1941. There are 83 males and 57 females in the group studied. Their youngest patient was 14 years of age and the oldest 68. Patients in the group with active pulmonary tuberculosis numbered 138 and two others had extrapulmonary tuberculosis without active pulmonary lesions. Those with advanced pulmonary disease numbered 116 and moderately advanced 21, with only one minimal case. Patients with cavities numbered 130. In 62 patients the disease terminated fatally and 57 were discharged alive. There were 21 under treatment at the time the article was written.

The authors elaborate upon their methods of diagnosis, the relation to the mastoid, routes of infection, complications, treatment, results of treatment, prognosis, summary and conclusions. They give 11 important points in conclusion. There are three tables and 20 references to the literature.

The article is rather long, but very complete. It shows a great deal of thoroughness in the diagnosis, as well as the treatment of the patients.

Guggenheim, Rotenberg and Laff[14] call attention to the rare occurrence of tuberculosis of the esophagus and an almost total absence of reference to such a disease entity in medical textbooks. Autopsy statistics show the esophagus is diseased less frequently than the stomach. The location of the tuberculous lesion in the esophagus is in part determined by the extension from the pharynx, from mediastinal lymph nodes, Pott's disease of the spine, etc.

The authors report one case of tuberculosis of the esophagus secondary to a chronic pulmonary tuberculosis of many years' duration. The lesion was in the lower one-third of the esophagus. They show two illustrations, of which one shows the pulmonary disease and the other the esophageal lesion as found at autopsy. The biopsy of the tuberculoma, found during an esophagoscopy a short time before death, failed to show the specific infection.

Tuberculosis of the esophagus has been diagnosed more frequently during the past 10 years, because peroral endoscopy has been used frequently for diagnosis and treatment in the tuberculous.

The article, with a case report, is very complete and the

case was well worked up, as is the custom at the National Jewish Hospital for Consumptives.

Proctor[15] reports laryngeal tuberculosis in the negro from November, 1940, to September, 1942, in the Henryton Tuberculosis Sanitorium. The report is based on the first 600 routine laryngeal examinations done at the sanitorium. Fourteen per cent had minimal tuberculosis, 36 per cent moderately advanced, and 49 per cent far advanced. A fraction more than 1 per cent proved to be nontuberculous. The ages were from 11 to past 60. Forty-six per cent of the patients were females and 54 per cent males.

Proctor classifies the laryngeal lesions as hyperemia, edema, thickened mucous membrane, redundant mucous membrane and nodular outgrowths, superficial ulceration and destruction of the deeper laryngeal tissues. He gives a detailed description of these lesions as he found them. He believes pain from laryngeal tuberculosis is more common in the negro than in the white patients and he attributes this to the difference in the type of lesion, as the nodular outgrowths and chronic thickenings of the mucous membrane are more prominent characteristics in the negro race than in the white.

Proctor believes voice rest is the most important method of treatment. He found from his experience that the cautery is not as valuable as the literature would lead us to expect. There are seven tables and illustrations.

The article is long and in many details quite complete. The classification of pathological lesions is not very definite and is not very scientific.

McCay and Hawkins[16] review the results of treatment with the Cemach ultra-violet lamp in 24 cases during 14 months. Twelve patients showed improvement, six were unchanged and six were worse. The exposures varied from five to 78. In four patients the ultra-violet therapy was supplemented by the electrocautery, the number of applications varying from three to 14. All patients, with the exception of two, had extensive pulmonary tuberculosis. The results showed that 50 per cent had improvement in the local condition. There is a long table showing the results.

The authors admit the series of cases is most too small to draw many conclusions. All of the patients were well studied.

McConkey[17] reports on the value of cod liver oil and tomato juice in the prevention of laryngeal tuberculosis complicating pulmonary tuberculosis. He and Smith had previously reported on the value of the remedy in preventing intestinal tuberculosis. McConkey used for this study 420 patients, 80 per cent in the moderately and 20 per cent in the far advanced stage of pulmonary tuberculosis, who showed no evidence of laryngeal tuberculosis at the time of the admission to the sanatorium. The patients in this group did not receive cod liver oil and tomato juice, and 14, or 3.3 per cent, developed the complication during their residence at the sanatorium. There were 371 patients, comparable as to the extent of the pulmonary disease, who received the remedy, and only four, or approximately 1 per cent, developed laryngeal tuberculosis while under observation. The sanatorium regimen was the same for the two groups. Necropsy studies tended to support the value of the remedy in the prevention of laryngeal tuberculosis. The article has one chart to show the increased use of cod liver oil and tomato juice by all of the people in the United States from 1929 to 1941 inclusive. There are three references.

The article shows the importance of vitamins in prevention and adds a new and timely improvement in our methods of caring for the tuberculous.

Voorsanger[18] calls attention to the infrequency of reports in the literature of extrusion or sloughing off of an arytenoid or cricoid cartilage. Typhoid fever, syphilis and tuberculosis are given by Chevalier Jackson as the most common causes. In perichondritis of the arytenoid or cricoid cartilages there is frequently immobility of the arytenoid cartilages due to involvement of the cricoarytenoid joint. External palpation of the larynx usually discloses absence of the usual clean-cut laryngeal contours. X-ray studies may show changes from the normal contour of the laryngeal cartilages and the extent of the edema. The complications of tuberculous perichondritis include abscess, necrosis of the cartilage, extrusion of the sequestrum, atresia of the laryngeal lumen and chondroma. The author reports one case with recovery. He shows four X-ray films. A series of tomographic films proves the diagnosis.

The case is unusual and of considerable interest. The

patient was thoroughly studied and well reported. Rare cases should be reported.

Raimondi and Nijensohn[19] report the case of a young man, 20 years old, first seen by the authors in May, 1939. He was referred by another doctor, and in 1938 an artificial pneumothorax had been done for pulmonary tuberculosis. Following this, the pulmonary condition improved rapidly, but the laryngeal lesions continued to get worse.

In May, 1939, quartz lamp treatment was begun. The usual procedure was varied by the local administration of powdered adrenalin and cocaine before each treatment. Treatments were given bi-weekly in a series of 20, with intervals of two weeks to a month between each series. The patient had seven series in three years. The lesions on the vocal cords improved rapidly and a little later the voice was restored. The dysphagia was considerably relieved. Eight photographs illustrate the progress made by the treatment in halting the progress of the disease. The last one shows normal vocal cords. The patient gained weight and the bacterial test was negative.

The quartz lamp treatment has a valuable place in the treatment of laryngeal tuberculosis. It should be used.

Brahy[20] finds among a thousand cases of pulmonary tuberculosis seen by him that 15 to 20 per cent had otorrhea. Of this latter number, 10 per cent had tuberculous otitis. The sex incidence was one female to five males. In some cases where the pulmonary condition had been arrested the otitis still persisted after several years and periodic laboratory tests were positive for tuberculosis. The patient lived, but the otitis was not cured. Tuberculous otitis is nearly always secondary to pulmonary tuberculosis. Its course is rapid, but it is not painful, so that frequently the patient is not seen by the otologist until the condition is far advanced. The perforation of the eardrum affords drainage, so that the mastoid is seldom involved. There is often necrosis and osteitis, with sometimes diffuse meningitis, but often the patient dies of pulmonary tuberculosis before these complications develop.

Tuberculous otitis media often goes undiagnosed even by capable otologists. The secondary infection by the staphylococcus masks the real etiology. The patient is treated for

chronic otorrhea caused by pyogenic organisms and nothing more.

Ribeiro[21] gave a general review, in the form of a lecture, dealing mostly with the difficulty of differentiating between tuberculosis of the tonsils and the inflammatory lesions of a benign nature. The article does not lend itself to abstracting and contains no original material.

Conklin[22] reports his experiences and observations on some 200 patients in the University State Tuberculosis Hospital in Oregon. Bronchoscopy has been used as a routine diagnostic procedure since July 1, 1940, without a single misadventure for the majority of the patients. It has been omitted or deferred only in a comparatively small group. Patients with advanced pulmonary or laryngeal tuberculosis are not bronchoscoped.

The author believes the generally accepted diagnostic or suggestive symptoms and findings of tracheobronchial tuberculosis are as follows:

1. Audible respiratory wheeze.

2. Parasternal or substernal discomfort.

3. Difficulty in raising sputum.

4. Asthmatoid attacks or dyspnea more marked than the pulmonary pathology would lead one to expect.

5. Capricious temperature elevations.

6. Cyanosis.

7. Parasternal rhonchi.

8. Signs of atelectasis or emphysema.

9. Marked variation in daily sputum volume or bacillus content.

10. Persistent or occasionally positive sputum in spite of well controlled parenchymal disease.

11. Bronchographic evidence of bronchiectasis, bronchial stenosis or ulceration.

12. X-ray evidence of blocked or tension cavities.

13. Atelectasis or emphysema as demonstrated by X-ray.

14. Hemoptysis, positive sputum or bronchogenic spread in the absence of pulmonary cavitation.

The author uses silver nitrate, electrocoagulation, mercury vapor lamp, X-ray and radical surgery such as pneumonectomy.

The summary and conclusions are excellent. There are 25 references. The article is well worth reading.

Perez[23] reviews the more recent development of our knowledge of tracheobronchial tuberculosis. He discusses the bronchial factor in the development of pulmonary tuberculosis, the relation between the bronchi and the size of the tuberculous cavities, the bronchus and the healing of cavities, tuberculous lesions and bronchial stenosis, bronchial lesions and positive sputum and bronchiectasis. The study includes 10 patients who had died from tuberculosis. Six to 14 blocks were made from each pair of lungs. One large table shows the results of the postmortem study of the lungs. The results of the study show the lesions of the trachea, of the main bronchi, of the stem lobar bronchi and lesions of the small intralobar bronchi. Tuberculous lesions were encountered with increasing frequency as the examination was extended to deeper parts of the respiratory system. Tuberculosis was found in the great majority of the cases in the trachea, main bronchi or stem bronchi to the pulmonary lobes, and in practically all cases in the walls of the small bronchi draining tuberculous regions. The pathology consists of mural caseation and epithelioid tubercles and superficial and deep ulceration. Deep excavation of the wall and cicatricial changes leading to contraction were uncommon. There are nine references.

There is very little which is new in the article. It substantiates the pathology as previously reported.

Spencer[24] reports pharyngeal tuberculosis in South Africa in patients who had eaten the uncooked flesh of dead animals. His case was a native woman of 26 years who suffered pain in the pharynx at night and when she swallowed. This had lasted for two months and was most severe at the rima glottidis. The mucous membrane was red and swollen, but there were no apparent ulcers. There was definite consolidation of the left apex. There was cough with scanty expectoration.

The patient would not permit a laryngeal mirror examination. Death ensued later from starvation. He mentions briefly other patients who died from tuberculosis. When their goats died on the farm the meat was eaten uncooked.

The war may bring to our attention many other similar cases. Such a case is unusual in the United States. Raw meat is almost never used for food in this country.

Horgan[25] reports an unusual and interesting case of laryngopharyngeal tuberculosis of seven years' duration in a male which resulted in complete occlusion of the larynx and cricopharynx. He examined the patient the first time in July, 1934, at which time the patient was 61 years old. There was a small, pale granulomatous tumor on the left false cord. The oral sepsis was very bad. Two months later the tumor had enlarged slightly.

In August, 1940, the patient suffered from increasing dyspnea, mostly on slight exertion, aphonia, anorexia, loss of weight and left otalgia. The left false cord was hard, swollen and hyperemic in its whole extent and the disease involved the upper surface of the left true cord. There was pseudoedema of the arytenoids, more marked on the left. There was marked limitation in adduction and abduction of each cord and a narrowed glottic chink seriously interfered with respiration. The blood Wassermann, chest examination and X-rays were negative. A tracheotomy was performed.

In September, 1941, there was a tumor of both sides of the larynx involving the true and false cords, the arytenoids and aryepiglottic folds. There was complete obstruction at the level of the ventricular bands with extension to the hypopharynx. The epiglottis was not involved. An esophagoscope could not be passed. A gastrostomy was performed a few days later. The patient lived one month. Permission for an autopsy could not be obtained. There are six references.

The case is unusual and was thoroughly studied clinically. It is well reported.

Huang[26] reports on the pathology of tuberculosis of the trachea and bronchi of patients in the University of Michigan Hospital from July, 1936, to December, 1941, or for five and one-half years. He continued the study of Bugher, Littig

and Culp. He reviews briefly the history of the disease and includes in his series all patients with active pulmonary tuberculosis regardless of the cause of death. The routine specimens consist of from one to three sections of the larynx, trachea and bronchi. More sections were prepared when gross lesions were present.

In a series of 115 autopsied cases, Huang found involvement of some portion of the larynx, trachea or bronchi in 50.4 per cent. In one group of 90 cases, without laryngeal involvement, there was tuberculosis of the trachea or bronchi or both in 33 cases, while nine of the 25 cases with tuberculous laryngitis were free from any lesion in the trachea or bronchi. There are eight tables in the article and 31 references.

The paper is very complete and represents a complete study of the pathology. Preceding articles of a similar nature are quoted and due credit is given the authors.

Salkin, Cadden and Edson[27] report their postmortem studies of 125 consecutive autopsies performed on patients dying from pulmonary tuberculosis from June, 1937, to January, 1941. They also studied clinically 622 consecutive admissions during the same period at Hopemont Sanitarium. They found tuberculous lesions in the trachea and bronchi in 40 per cent of the 125 autopsies. The lesions included all varieties of ulcers, submucosal nodules, fibrous and inflammatory stenoses. No symptom, or group of symptoms, was found to be pathognomonic of tracheobronchitis.

Every new patient admitted from June, 1937, to March, 1941, was bronchoscoped within a few days after admission and before any treatment was begun. Observation of these patients was extended to June, 1942. The entire group was bronchoscoped over 2,000 times, thus giving an average of three examinations per patient.

Sixty-four of the 622 patients showed a tuberculous lesion at the first examination. Eventually 33 more showed positive bronchial findings. A total of 97 showed a tracheobronchitis. There were 52 cases of laryngitis.

The authors discuss the relationship of bronchitis to laryngitis, classification, symptoms and signs, Roentgenological

signs, differential diagnosis of certain symptoms, course and progress of tracheobronchitis, prognosis, mode of healing, bronchostenosis, bronchograms in fibrotic stenosis and inflammatory stenosis, complications of bronchoscopy, treatment and conclusions. There are five tables and 20 references.

The series of cases is larger than many which appear in the journals. The autopsy findings, clinical signs and symptoms are well presented. The article is an excellent one and should be read by all those interested in tracheobronchitis.

Wilson[28] reports his more recent experiences with tuberculosis of the ears, mouth and larynx. He finds tuberculosis of the middle ear always secondary to tuberculosis in other organs such as the lungs. Aural tuberculosis developed within five per cent of the patients following thoracoplasty. Infection may reach the ear through the blood and lymph channels or by way of the Eustachian tube. The onset is gradual and without pain. The discharge is thin and watery. The disease of the ear is not fatal, although the complications may be. Mastoiditis is rare.

Wilson found oral tuberculosis rare. The lesions occurred on the gums, cheeks, soft palate, uvula, tongue, tonsils, pillars and pharynx.

Laryngeal tuberculosis has decreased 50 per cent in recent years as the result of collapse therapy. Earlier diagnosis of the pulmonary disease has also helped to prevent infection of the larynx. Wilson discusses the clinical pathology and the symptoms of the laryngeal complications. He found cauterization of the larynx the most valuable single method of treatment; but light treatment was not very satisfactory. There are 28 references.

The author says he has nothing new or striking to bring forth. He covers the subject very thoroughly and his extensive experience makes his comments well worth reading.

Eaton[29] did 219 bronchoscopies on 597 patients during the year ending July 1, 1941, for the diagnosis and treatment of tuberculous tracheobronchitis. Bronchoscopy was done on 71 nontuberculous patients. The summary, conclusions and opinions are based on 148 bronchoscopies on 93 patients with pulmonary tuberculosis. The incidence of tracheobronchitis was

estimated from suggestive symptoms. Fifty-four per cent of the 93 patients studied had tracheobronchitis. The 54 were 11 per cent of all the patients.

Far advanced pulmonary cases showed 62 per cent positive findings. Minimal and moderately advanced, 46 per cent. The two most valuable X-ray evidences of tuberculous tracheobronchitis are atelectasis and a partially obstructed cavity according to the author. Bronchoscopy is definitely indicated for diagnosis and treatment and occupies an important place according to Eaton.

The article is rather short, but to the point. It proves the author's contention.

From the reviewer's point of view there is too much repetition in the medical journals. This has been carried even to a monotony. There are, however, several articles which have more than passing merit and because of this these articles are listed by the author's last name. These are as follows: Iglauer's, Cemach's, Berberich's, Clerf's, Benedict's, Guggenheim, Rotenberg and Laff's, McConkey's, Conklin's, Huang's, Salkin, Cadden and Edson's, and Wilson's. Busy otolaryngologists who believe they haven't the time to read all of the articles, or even the abstracts, should at least read the select group.

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